



Water quality analysis of four different ponds of Adimaly Panchayat of Idukki district

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Article History

Received: 29 July 2020

Reviewed: 30/July/2020 to 10/September/2020

Accepted: 12 September 2020

Prepared: 16 September 2020

Published: October 2020

Citation

Divya S Rajan, Upasana U. Water quality analysis of four different ponds of Adimaly Panchayat of Idukki district. *Discovery*, 2020, 56(298), 695-700

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General Note



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ABSTRACT

This paper deals with the study of physico-chemical parameters of water in four different ponds situated in Adimaly panchayat of Idukki district. The study was conducted in the monsoon season of 2014. The samples of water were collected and analysed using standard methods. But the Chattupara pond got degraded due to the dumping of waste materials. The water qualities of other four ponds are comparatively good and can be used for domestic and irrigation purposes. The study indicates the need for conservation of the degraded fresh water ecosystem for the sustainable utilization of various fishery resources.

Key words: Eutrophication, hydrographical parameters, Adimaly etc

1. INTRODUCTION

Aquatic ecosystems perform many important environmental functions. Common chemical stresses on freshwater ecosystem health include acidification, eutrophication and copper and pesticide contamination (Leathwick & Chadderton, 2007). Natural phenomena such as algae blooms, storms, and earthquakes also cause major changes in water quality and the ecological status of water (West and Larry, 2006).

The present study involves the analysis of water quality in terms of physico-chemical parameters of four different ponds in monsoon season. The four ponds such as Adimali, Karigulam, Pazhaya road, and Chattupara situated in Adimali panchayat of Idukki district were taken. On the view, out of the four ponds Chattupara pond getting degraded due to the dumping of industrial and agricultural effluents and domestic sewage in an uncontrolled manner. The remaining three are partially or completely pure for different purposes. The main objective of this study is to identify the water quality of the four different ponds in same village and comparing the water quality parameters. The purpose of the present investigation was to provide data on water chemistry and biological characteristics of fish ponds in selected freshwater areas of Adimaly panchayat of Idukki district. The study might be a reminder for the need of restoration of the degraded water quality of the ponds. This will create awareness among people to improve the water quality status and the need for the conservation of these natural paradises.

ADIMALI (POND1)



KARIGULAM (POND 2)



PAZHE ROAD (POND 3)



CHATTUPARA (POND 4)



FOUR SELECTED PONDS IN ADIMALY PANCHAYAT

2. MATERIALS AND METHODS

The present study was conducted during the monsoon season of the year 2018 and the water samples were collected from four different ponds situated in Adimaly, Karikulam, Pazhaya road and Chattupara in Adimali panchayathu of Idukki district. Water samples were collected in clean polythene bottles and were brought to the laboratory. The hydrographical parameters such as water temperature, pH, Dissolved oxygen, Carbon dioxide, Chloride, Fluoride, Nitrate, Nitrite, Ammonium, Phosphate, Iron, Total hardness and Transparency were analyzed following standard methods.

3. RESULTS AND DISCUSSION

In the present study the concentration of all parameters in all samples except in pond 4 were within permissible limit as prescribed by BIS standard. Study concerns about pond water quality are directly related to the uses of the pond. In the present study the water temperature ranged from 25 to 28.9 °C. All metabolic and physiological activities of the aquatic organisms are greatly influenced by water temperature. A degree of variation in the temperature of the water body has great bearing up on its productivity potential also. The variation recorded in the present study was not very great and as such it could not bring out any drastic fluctuations in the dynamics of the pond ecosystem of water study. Water temperature is an important factor indicating the quality of water. Low temperature values during monsoon might be due to heavy rainfall. It results in increased water level. High temperature values during pre-monsoon might be due to low water level and greater solar radiation leading to low relative humidity. Fluctuations in water temperature experienced in the present study may be due to the timing of collection and influence of season.

The pH of the water ranged from 5.89 to 7.6. In pond 4 the pH is less than 7 it indicates that pond water is acidic while others were slightly alkaline or neutral. Pond fish prefer a neutral pH and can be fatally stressed by high pH values. Different types of fish tolerate different pH levels but, in general most fish will live in ponds with a pH near 7.0. Ponds with a pH less than 6.0 may result in reduced fish population. An elevated pH value increases the toxicity of other substances. Ammonia is ten times more dangerous to pond fish at a pH of 9.0 than it is at pH 8.0. Ammonia causes damage to the gill tissue and blocks the transfer of oxygen from the gills to the blood. Ammonia also destroys the membranes which produce mucus, which damages internal intestinal surfaces. Pond fish which are suffering from ammonia poisoning are visually sluggish and gasp for air at the water's surface (John & Hargreaves, 2004).

Dissolved oxygen recorded during the study period varied from 2.8 to 4.9 mg/l. In Chattupara pond, the DO is very low while others are in permissible limits. Its correlation with water body gives direct and indirect information of the bacterial activity, photosynthesis, availability of nutrients, stratification etc. So the fish fauna is very less in Chattupara pond. The low DO concentration may be due to poor aeration (Kils, and Fischer, 1989).

Table 1 Variation of physico-chemical parameters of four stations

SL NO	PARAMETERS	POND 1	POND 2	POND 3	POND 4
1	TEMPERATURE(°C)	25	26	26.5	28.9
2	pH	7.1	7.4	7.6	5.89
3	OXYGEN(mg/l)	4.9	4.7	4.2	2.8
4	FREE CO ₂ (mg/l)	2.5	3	3.2	6.5
5	CHLORIDE(mg/l)	1.3	3	3.7	30
6	FLUORIDE(mg/l)	-	-	0.032	0.19
7	NITRATE(mg/l)	4.1	4.5	4.8	8.9
8	NITRITE(mg/l)	-	-	-	0.25
9	AMMONIUM(mg/l)	-	-	-	0.91
10	PHOSPHATE(mg/l)	0.01	0.002	-	1.88
11	IRON(mg/l)	-	-	-	0.26
12	TOTAL HARDNESS(mg/l)	15	20	25	52
13	SECCHI DISC TRANSPARENCY	30	35	38.2	110.5

(-) = Absent

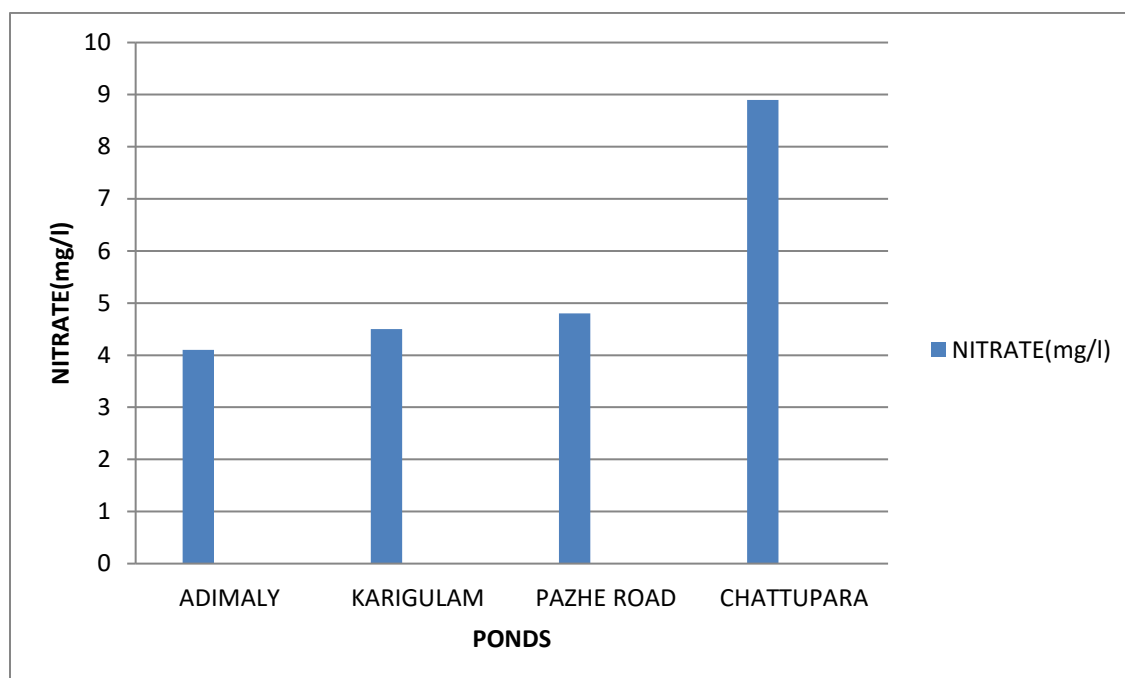


Figure 1 Variation of nitrate in four different ponds

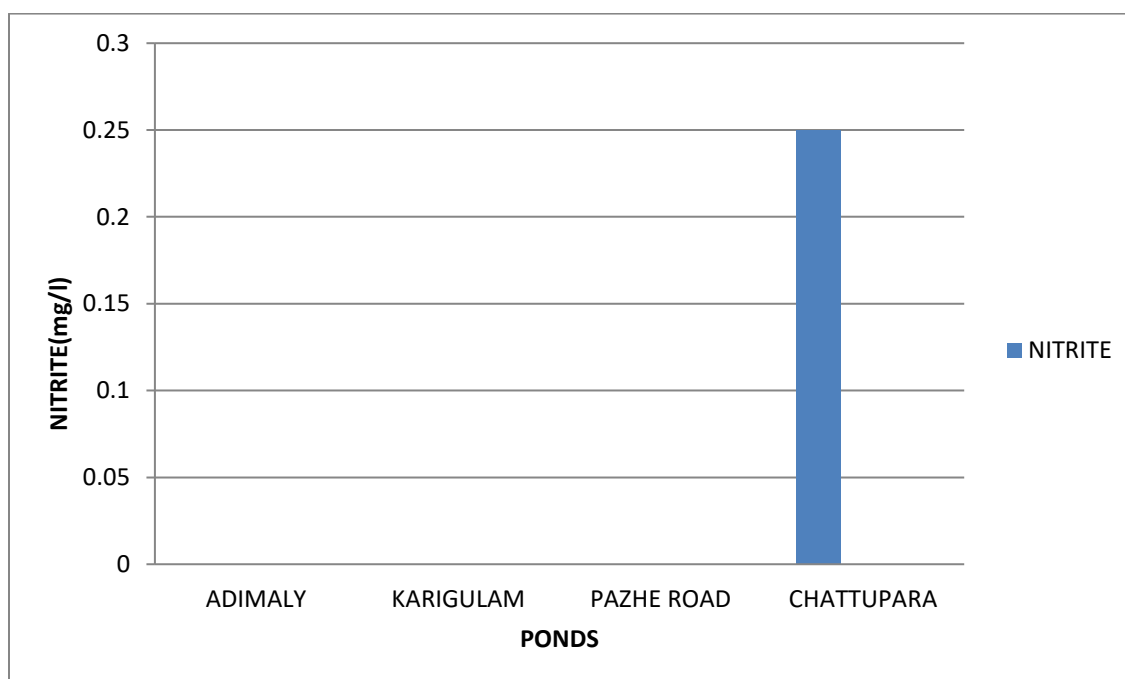


Figure 2 Variation of nitrite in four different ponds

Carbon dioxide is the end product of organic carbon degradation in almost all aquatic environments (Smith, 1997). In this study the amount of carbon dioxide ranges from 2.5 to 6.5 mg/l. All are within permissible limit. High range found in Chattupara pond. Most of the carbon dioxide in water comes from the decay of organic materials and from respiration occurs in both plants and animals. In present study the amount of chloride ranges from 1.3 to 30 mg/l. High value was noted in Chattupara pond. But all were within permissible limit. The main potential health hazards are eye and nose irritation, stomach discomfort etc increases with respect to the chloride nature of water. In present study fluoride was present only in pond 3 (Pazhe road) and pond 4 (Chattupara). But it

was found below the BIS standard limit. The rate of fluoride present in pond 3 and pond 4 is 0.032 and 0.19mg/l respectively. Excess fluoride intake through drinking can cause dental, skeletal and non skeletal fluorosis. In this study the rate of nitrate ranged from 4.1 to 8.9 mg/l. 8.9mg/l of nitrate was present in Chattupara pond. Nitrate is an important factor for controlling the abundance and occurrence of phytoplankton may thus take place through rain and agricultural runoff from the surroundings (Egeman and Sunlu, 1996). In this study 0.25mg/l nitrite is present only in Chattupara pond (Fig 1, 2 & 3). Ammonia and iron is present only in Chattupara pond. Eutrophication, bringing with it high amounts of phosphates and nitrates, is a main cause in the destruction of lake ecosystems around the world (Ansar & Khad, 2005). Hardness was high in Chattupara pond. Secchi disc transparency ranged from 30 to 110.5. Pure water has low transparency rate but polluted water show high transparency rate.

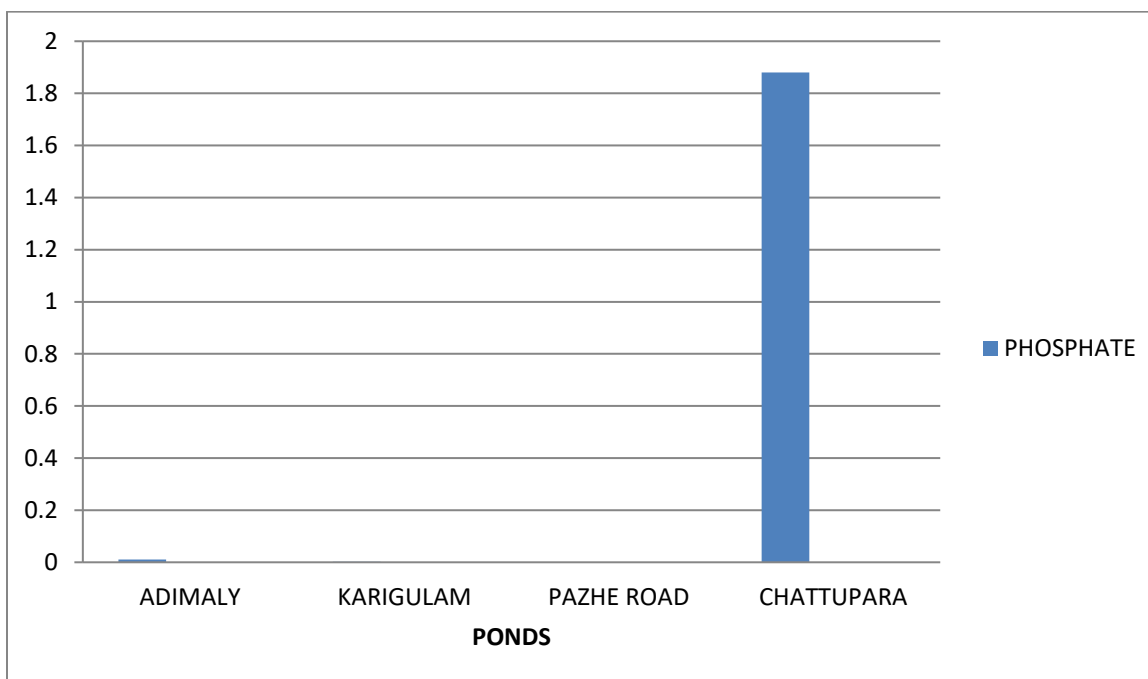


Figure 3 Variation of phosphate in four different ponds

From the study, it can be concluded that in the concentration of all the parameters in all the sample were found in permissible limit as prescribed by BIS standards. But the fifth pond Chattupara is polluted than others because dumping of agricultural effluents and domestic sewages in an uncontrolled manner. The remaining three ponds are pollution free and are suitable for fisheries and irrigation purposes.

4. CONCLUSION

In the present study the concentration of all the parameters in all samples were found within the permissible limit as prescribed by BIS standard. The concentration of nutrients was also found below the BIS standard limit. But in pond 4 (Chattupara) the rate of nutrients are high comparing with other ponds. So it will cause eutrophication. As nutrient level rise, growth of phytoplankton is no longer nutrient-limited and algal blooms occurs. If the blooming algae produce toxic chemicals, fish kills and adverse human health effects can occur. There was an industry around this pond, so the metals like Fe were present. It is also interesting to know that the ponds Adimali, Karigulam and Pazhe road are pollution free from fertilizers and pesticides. While Chattupara pond is polluted because of dumping of agricultural effluents and domestic sewages in an uncontrolled manner. The result indicated that water of four ponds were within BIS standard limit. But the Chattupara pond is not used for drinking and irrigation purposes because it will cause eye/nose irritation, skin diseases, stomach discomfort etc. due to the presence of nutrients and other parameters near the BIS standard limit. So this pond can convert for aquaculture.

Funding:

This study has not received any external funding.

Conflict of Interest:

The authors declare that there are no conflicts of interests.

Peer-review:

External peer-review was done through double-blind method.

Data and materials availability:

All data associated with this study are present in the paper.

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